3. DESCRIPTION OF SITE, FACILITY, AND OPERATIONS

This chapter contains a description of the LANSCE site, facility, safety systems, organization for operations, and facility operations.

3.1 SITE DESCRIPTION

This section includes a summary of the environmental setting of Los Alamos National Laboratory and LANSCE relevant the safety analysis. Additional environmental information is available in the Environmental Impact Statement for Los Alamos (DOE 1979), annual reports on environmental surveillance, and references cited therein.

3.1.1 Site Location

Los Alamos National Laboratory and the residential areas of Los Alamos and White Rock are in Los Alamos County, which is in north central New Mexico approximately 100 km north-northeast of Albuquerque, 50 km northwest of Santa Fe, and 36 km south-west of Española (Figure 1). The Los Alamos townsite is northwest of Technical Area 53 (the LANSCE site) and has a population of approximately 11,500. The nearest residence is an isolated home about 1 km northeast of TA-53. White Rock is southeast of TA-53 and has a population of about 7,000, with the nearest residence about 6.5 km from TA-53. No industrial, transportation, or military centers are nearby.

Figure 3-1. Location of Los Alamos.

Most Laboratory and community developments are confined to mesa tops. Surrounding land is largely undeveloped and provides an isolation buffer for security and safety and a reserve for future Laboratory development. Large tracts north, west, and south of the Laboratory site are held by the Santa Fe National Forest, Bureau of Land Management, Bandelier National Monument, General Services Administration, and Los Alamos County. San Ildefonso Pueblo land borders the Laboratory to the east.

Laboratory land is used for building sites, test areas, waste disposal areas, roads and parking, and utility rights-of-way. Present land use is approximately 570 hectares of the total 11,130 hectares. The Laboratory is divided into some 50 designated technical areas as shown in Figure 3-2.

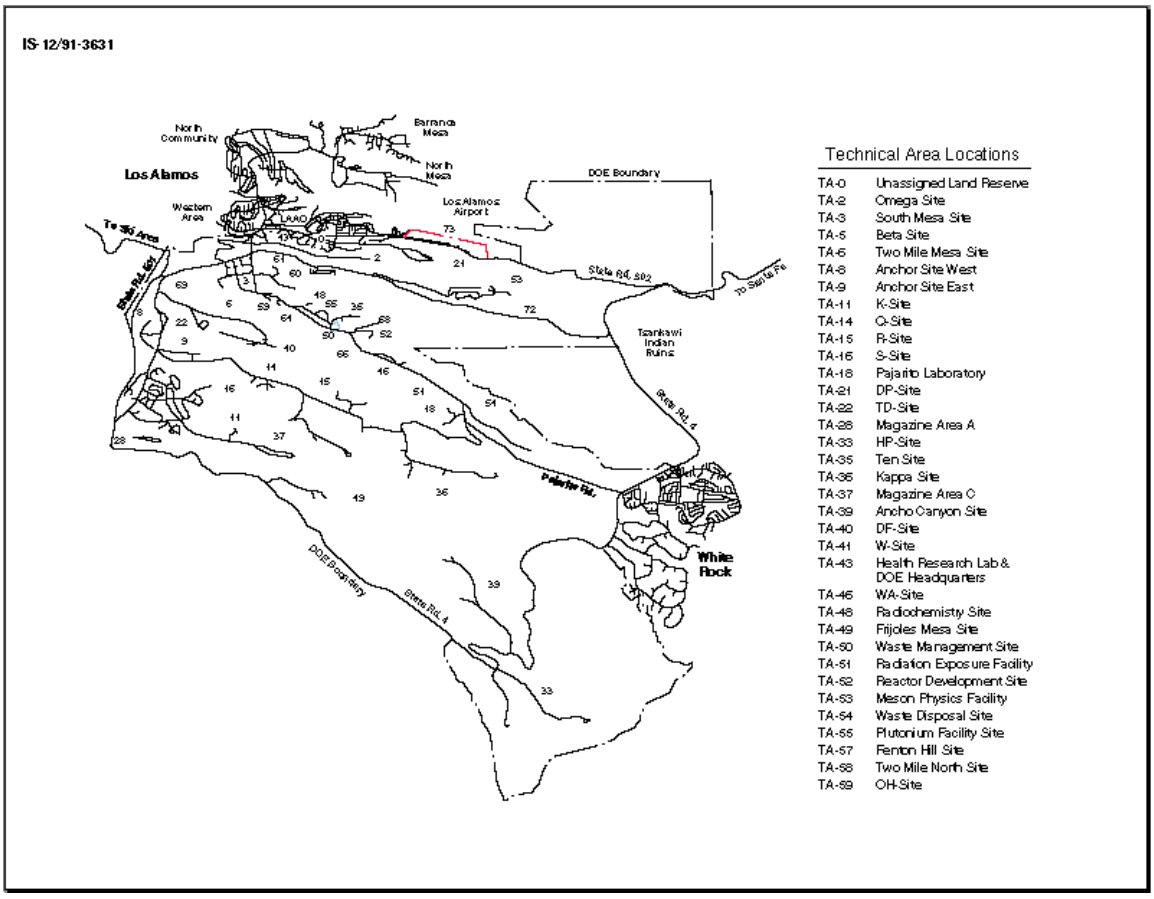

Figure 3-2. Location of technical areas in Los Alamos County.

DOE controls the area within the Laboratory boundary and may if necessary restrict access. Limited public access is allowed in certain areas of the Laboratory reservation. Some roads within the Laboratory boundary are normally open to the public. Air traffic patterns, including emergency routes and Los Alamos airport approaches, avoid TA-53 and the Laboratory in general. TA-53 is approximately 1 km from the airport and, since the facility is within a federal restricted area, low-level site overflights are rare.

Figure 3-3 shows the principal roads and LANSCE structures within TA-53. East Jemez Road provides the only vehicle access to the site, is not a through road, and is posted for entrance on official business only. Access is controlled during working hours by an attendant at the entrance gate. During non-working hours, the gate is closed and access is obtained through use of a badge reader.

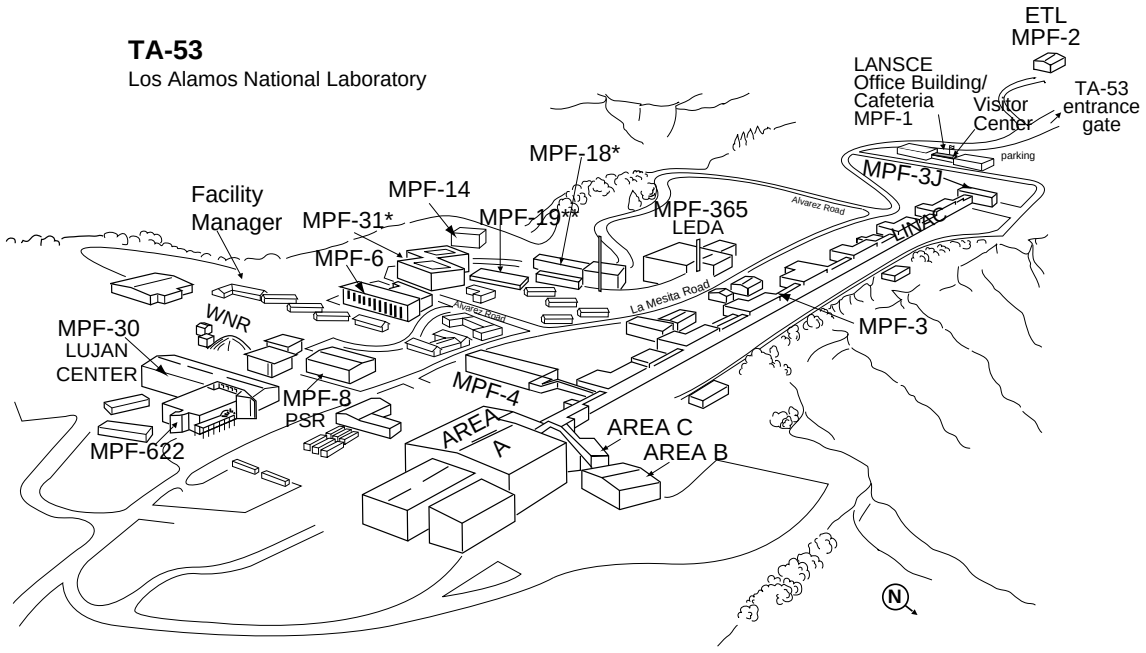

Figure 3-3. Overview of Technical Area 53, view to the southwest.

3.1.2 Geology and Seismology

Figure 3-4 is a sketch of the typical geology of the Los Alamos area. Most of the finger-like mesas in the Laboratory area are cut in Bandelier Tuff. Ashfall, ashfall pumice, and rhyolitic tuff form the surface of the Pajarito Plateau. The tuff, ranging from non-welded to welded, is more than 300 m thick in the western part of Pajarito Plateau and thins to about 80 m toward the eastern end above the Rio Grande. The tuff was deposited during a major volcanic eruption in the western Jemez Mountains over 1 million years ago.

The tuffs overlap onto older volcanic deposits of the Tschicoma Formation, which forms the Jemez Mountains along the western edge of the plateau. They are underlain by conglomerates of the Puye Formation in the central and eastern edge along the Rio Grande. Chino Mesa basalts inter-finger with the conglomerate along the river. These formations overlie the sediments of the Tesuque Formation, which extends across the Rio Grande Valley and is more than 1000 m thick.

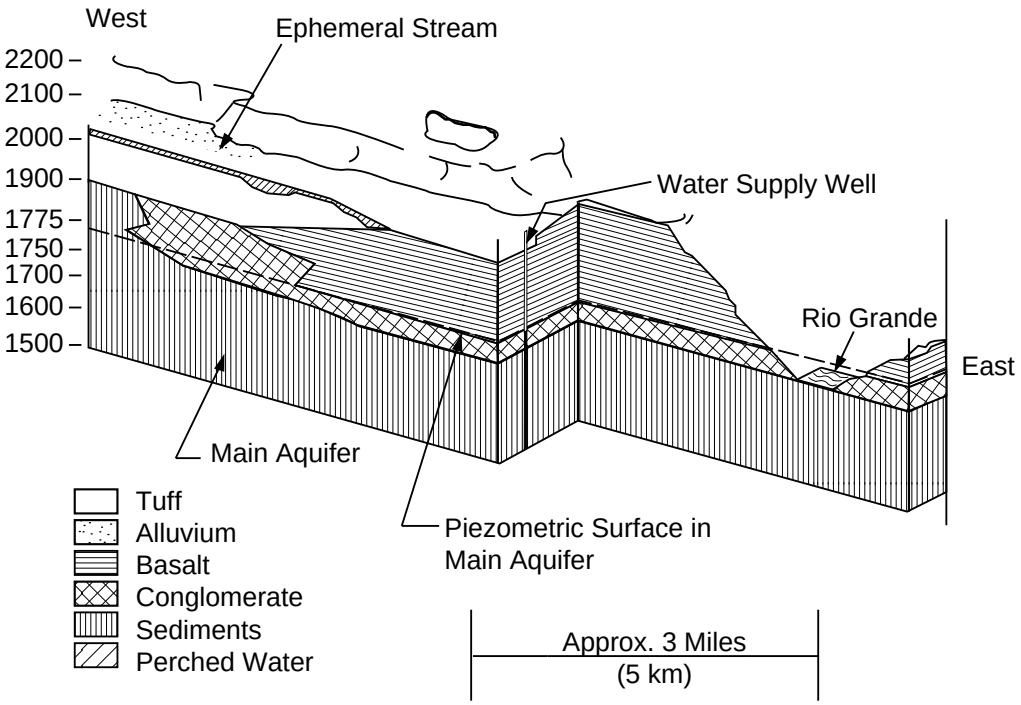

Figure 3-4. Geology of the Los Alamos area.

The Laboratory is on the western edge of the Rio Grande Rift. Seismic activity within 110 km of Los Alamos is low. Only one earthquake of magnitude 5.5 on the Richter scale is known to have occurred in the vicinity of Los Alamos within the last 150 years. Figure 3-5 plots the estimated magnitude of earthquakes at Los Alamos versus expected return period.

Structural design at LANL is based on the requirements of DOE Order 5480.28 and the application guidance of DOE STD 1020 and 1021. In addition, a seismic hazard evaluation study of Los Alamos by Woodward-Clyde (1995) provides peak acceleration and spectral data for various performance categories. PC 2 criteria have been applied to TA-53 facilities.

3.1.3 Hydrology

The surface water of the Los Alamos area generally occurs as intermittent streams. Springs on the flanks of the Jemez Mountains supply base flow into the upper reaches of some canyons; however, the amount is insufficient to maintain surface flows across the Laboratory site before being depleted by evaporation, transpiration, and infiltration. Runoff from heavy thunderstorms or heavy snow melt reaches the Rio Grande several times a year. TA-53 is located entirely on Mesita de Los Alamos, which drains readily into

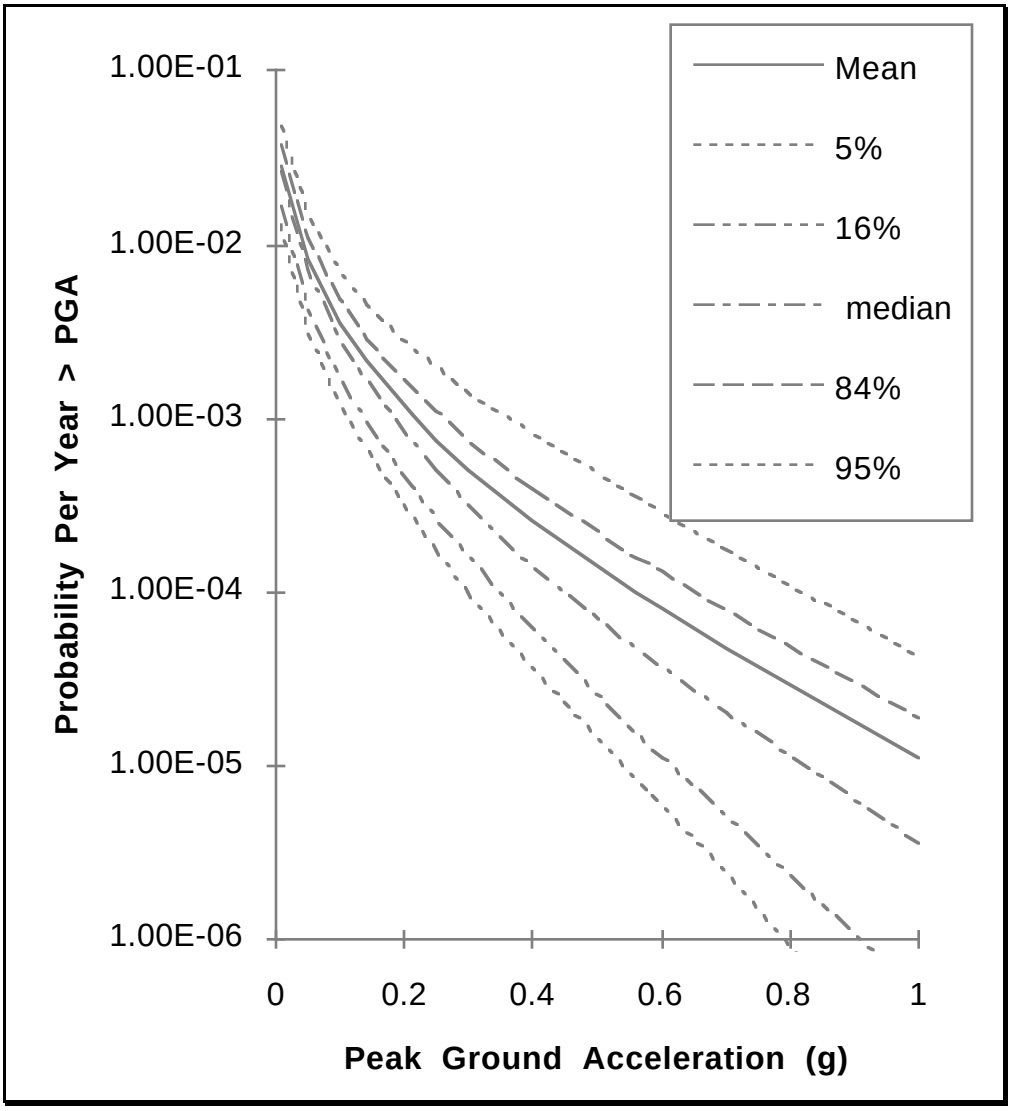

Figure 3-5. Earthquake hazard at Los Alamos.

Los Alamos and Sandia Canyons. Because the drainage area into TA-53 is small and no impounded water exists above the site, flooding of the site is virtually impossible.

In the Los Alamos area, groundwater occurs in two principal modes: water in shallow alluvium in canyons and the main aquifer of the Los Alamos area (see Figure 3-4).

Most canyons on the plateau have alluvial deposits that range from less than 1 m to as much as 30 m in thickness. In contrast to the underlying volcanic tuff and sediments, the alluvium is quite permeable. Intermittent runoff in canyons infiltrates the alluvium until its downward movement is impeded by the less permeable tuff and volcanic sediment, resulting in a body of shallow alluvial groundwater that moves down gradient in the alluvium.

The main aquifer of the Los Alamos area is the only aquifer in the area that can serve as a municipal water supply. The DOE operates three well fields of deep wells that supply the Laboratory and the county with water from this aquifer. The surface of the aquifer rises westward from the Rio Grande within the Tesuque Formation and falls into the lower part of the Puye Formation beneath the central and western part of the plateau. The depth of the aquifer decreases from 360 m along the western margin of the plateau to about 180 m at the eastern margin. The main aquifer is isolated from alluvial and perched waters by about 110 to 190 m of dry tuff of very low hydraulic conductivity and by volcanic sediments. Little hydrologic connection exists between the site and the main aquifer.

3.1.4 Climatology and Meteorology

Los Alamos has a semi-arid, temperate mountain climate. Average annual precipitation is nearly 460 mm. Forty percent of the annual precipitation occurs as thundershowers during July and August. Winter precipitation falls primarily as snow, with an annual total snowfall of about 1.3 m.

Summers are generally sunny with warm days and cool nights. Maximum temperatures are usually below 32° C. Brief afternoon and evening thundershowers are common, especially in July and August. High altitude, light winds, clear skies, and a dry atmosphere cause night temperatures to drop below 15° C even after the warmest day. Winter temperatures range from about –7° C at night and from +5° C during the day. Snowstorms with accumulations exceeding 10 cm are common in Los Alamos.

Because of complex terrain, surface winds in Los Alamos often vary dramatically with time of day and location. Because of light, large-scaled winds and clear skies, a distinct, daily wind cycle often exists: a light southeastern to southern upslope wind during the day and a light western to northwestern drainage wind during the night. Figure 3-6 shows the 1995 average annual wind pattern at TA-53.

The evaluation of risk from high winds is based on “Natural Phenomena Hazards Modeling Project: Extreme Wind/Tornado Hazard Models for Department of Energy Sites.” The study determined that the likelihood of a tornado was less than oneper million years.

Straight winds dominated the risk for any annual probability greater than one chance in a million. Figure 3-7 shows the likelihood of higher speed winds. Lightning is common over the Pajarito Plateau. On average, thunderstorms occur 58 days each year, mostly during the summer. All LANSCE buildings have lightning protection. Hailstones with diameters up to 6 mm are common; hailstones with a diameter of 12 mm are rare.

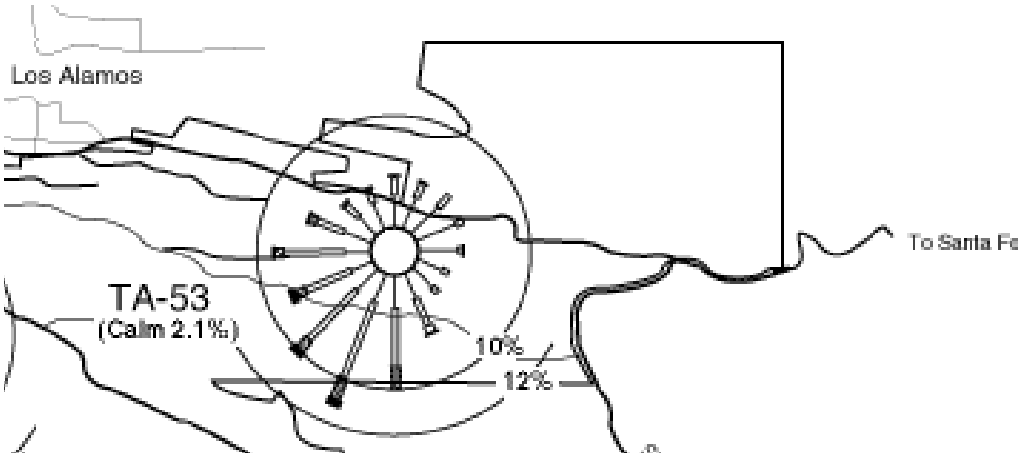

Figure 3-6. TA-53 1995 average wind rose.

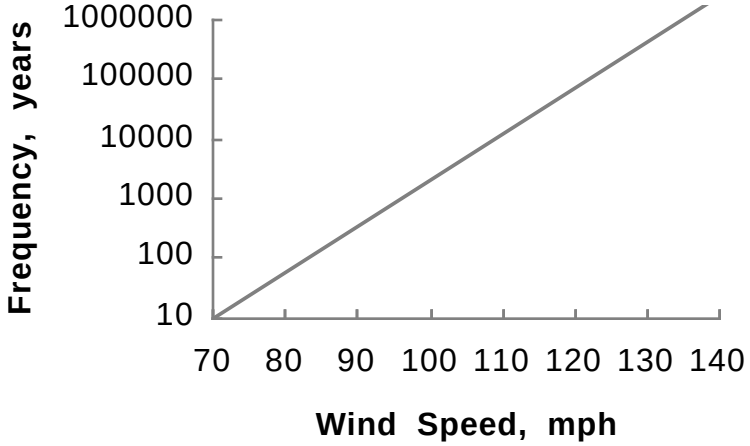

Figure 3-7. Estimated probability of high wind speeds at Los Alamos.

3.1.4.1 Atmospheric Dispersal

Frequent clear skies, light winds, complex terrain, and forest vegetation promote good daytime atmospheric dispersion at Los Alamos. At night, light winds and clear skies can allow low-level temperature inversions to form, especially in winter, trapping effluents at low levels and restricting atmospheric dispersion. Atmospheric stability conditions on the mesa tops of Los Alamos occur during approximately the following percentages of time: 20% unstable (good mixing); 50% neutral (fair mixing); and 30% stable (poor mixing).

3.1.5 Population Distribution

Based on the 1990 census, Los Alamos County has a population of approximately 18,500. The county has two residential and commercial areas: Los Alamos and White

Rock. With an estimated population of 11,500, the Los Alamos townsite, the original area of development, now includes the residential areas of the Eastern Area, the Western Area, North Community, Barranca Mesa, and North Mesa. White Rock includes the residential areas of White Rock, La Senda, and Pajarito Acres and has about 7,000 residents. About 40% of Laboratory employees commute from other counties. Population estimates for 1990 indicate about 213,000 people living within a 80-km (50-mile) radius of Los Alamos. The population at TA-53 is largest during beam operating periods, when site visitors are conducting experiments, and has been estimated to have been as high as 1100.

3.1.6 Ecological Features

The TA-53 foliage is predominantly juniper, pinon, and ponderosa trees, and native grasses. Sheer canyon walls at lower elevations serve as important nesting habitats for birds of prey. Generally, larger mammals and birds are wide ranging and occupy larger habitats. Smaller mammals, reptiles, invertebrates, and vegetation are more sensitive to variations in elevation; hence, they are confined to smaller ranges.

Past and present uses of the Laboratory environs have caused structural changes in plant communities. Land use will continue to have important consequences for local ecosystems. Before the Laboratory was established, farming on the mesas by Native Americans and by European settlers created disturbed areas that are now in various states of succession. These areas afford suitable feeding locations for herbivores, especially deer and elk, and adjacent timbered slopes that provide cover for these species.

One animal on the federal list of endangered species, the peregrine falcon, has an aerie in Los Alamos County north of the Laboratory and is known to hunt in the Laboratory reservation. The presence of eleven state-protected species and one plant species proposed for inclusion on the federal list of endangered species has been reported in Los Alamos County. Only one of these species has been reported on Laboratory property. No critical habitats have been defined on Laboratory lands.

TA-53 conforms to 10 Code of Federal Regulations (CFR) 1022, “Compliance with Floodplains/Wetlands Environmental Review Requirements,” because it is not in a flood-plain or wetland. The site does not imperil any rare or endangered species known to exist on Laboratory lands.

3.1.7 Summary of Site Characteristics

TA-53 is relatively isolated from population concentrations and public roads, and has no through traffic. Overhead airspace is controlled. There are natural barries between the

site and acquifers. The site is favorably located with respect to natural hazards. The ecological impacts are similar to those at other established Laboratory sites.